



THE SAM INSTRUMENTS

QUADRUPOLE MASS SPECTROMETER (QMS):

The QMS detects gases sampled from the atmosphere or those released from solid samples by heating. Its mass range is 2-535 Dalton so that it can detect even complex organic molecules. The QMS vacuum housing is shown below (left).

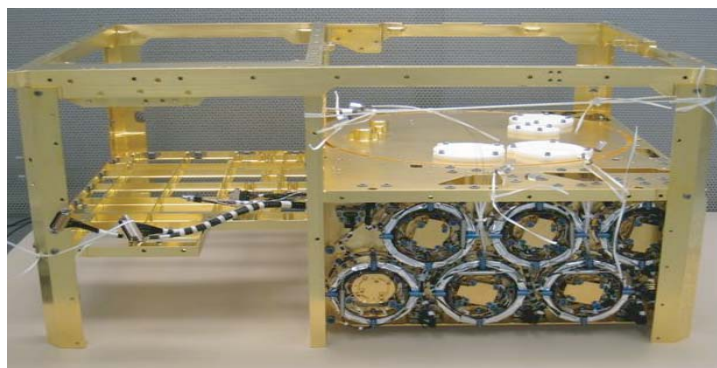


TUNABLE LASER SPECTROMETER (TLS):

The TLS (above right) implements a sensitive search for methane and makes precision measurements of O and C isotope ratios in carbon dioxide.

GAS CHROMATOGRAPH (GC):

The GC columns can separate out individual gases from a complex mixture. Six GC columns allow gases of different polarity to be sampled. These gases are detected by the QMS and by independent detectors in the GC assembly. The GC mounted in the SAM frame is shown below.



THE SAM TEAM

Science team: Principal Investigator, Paul Mahaffy/Goddard Space Flight Center (GSFC) with 43 CoInvestigators and Collaborators from 24 institutions (Paul.R.Mahaffy@nasa.gov)

Development team: Project Manager, Dr. Doug McLennan. Colocated team from Flight Projects, Engineering, Mission Assurance, Science organizations and GSFC support service contractors

GSFC: Quadrupole Mass Spectrometer, CSPL, Software

U. Paris/CNRS: Gas Chromatograph (Michel Cabane, Institutional PI)

JPL: Tunable Laser Spectrometer (Chris Webster, Institutional PI)

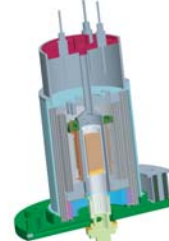
Honeybee Robotics: Sample Manipulation System (Steve Gorevan Lead)

Key external partners: U. Michigan Space Physics Laboratory (digital electronics), Creare (Wide Range Pump), Battel Engineering (power and analog electronics), AMU Engineering and Visioneering (mechanical design), BCI (precision fabrication), and many others

SAM SUPPORTING SUBSYSTEMS

SAMPLE MANIPULATION SYSTEM (SMS):

The SMS transports powder delivered from the MSL drill to a SAM inlets and into a sample cup. The SMS then moves the sample to the SAM oven to release gases by heating to ~1000 °C. The 74 cup SMS is shown below.



CHEMICAL SEPARATION AND PROCESSING LAB (CSPL):

The CSPL includes ovens and chemical scrubbers and getters that enable enrichment of the gases of most interest for analysis. A SAM oven is shown above (center). The SAM gas processing system includes heaters on all transfer lines and many highly miniaturized valves that send the gas to the SAM instruments or to the CSPL for processing. The miniature turbo pump (WRP) evacuates the QMS, the TLS, and the CSPL (shown above right).

SAM AND MSL OPERATIONS ON MARS

The other instrument in the MSL Analytical Laboratory (CheMin) identifies minerals. Samples to be processed by SAM and ChemMin are first located by using three other instruments of MSL, a mast stereo camera (MastCam) to locate rocks or outcrops of interest, a neutron detector (DAN) to find highly hydrated samples, and a laser ablation spectrometer system (ChemCam) that can interrogate surface rocks and soils near MSL. Once an interesting target is identified even more detailed inspection can be carried out with the MSL microscope (MAHLI), and the alpha particle and x-ray detector (APXS). The MSL drill will then powder a sample and deliver small samples to both SAM and ChemMin for detailed analysis of volatiles and minerals.



<http://ael.gsfc.nasa.gov/marsSAM.shtml>

<http://marsprogram.jpl.nasa.gov/missions/future/msl.html>

